

**REMARKS**

**I. STATUS OF THE CLAIMS**

Various of the claims are amended herein.

New claims 32-38 are added to further describe various embodiments of the present invention. Support for these claims is found, for example, on page 12, line 22 - page 14, line 25 and Fig. 2 of the specification.

In view of the above, it is respectfully submitted that claims 23-38 are currently pending and under consideration.

**II. REJECTION OF CLAIMS 23, 26, 28 AND 30 UNDER 35 U.S.C. § 112, SECOND PARAGRAPH**

Claims 23, 26, 28, and 30 are amended herein.

Withdrawn independent claims 24, 25, 27, 29, and 31 are also amended herein, to conform to the amendments made to independent claim 23. It is believed that these dependent claims should be allowed if independent claim 23 is eventually allowed.

In view of the above, it is respectfully submitted that the rejection is overcome.

**III. REJECTION OF CLAIMS 23, 26, 28 AND 30 UNDER 35 U.S.C. § 102(B) AS BEING ANTICIPATED BY McMAHON (USP # 4,461,543)**

The present invention as recited, for example, in claim 23 relates to a polarization control optical space switch, wherein "switching light from one input to one output requires controlling only one of said first, second and third elements."

McMahon discloses an optical switch including a birefringent device wherein the ordinary and extraordinary polarizations of unpolarized light relative and incident thereto are deflected therein to emerge therefrom along parallel paths.

However, the optical switch of McMahon appears to use more than one controlling element when switching light from an input terminal to an output terminal. More specifically, for example, it appears that the birefringent crystals and the liquid crystals as disclosed by McMahon, are both used as controlling elements in the switching state of the optical switch (see Figs. 7 and 8). Consequently, the optical switch of McMahon differs from the claimed polarization control optical space switch, wherein switching light from one input to one output

requires controlling only one element as recited, for example, in claim 23 of the present application.

Therefore, McMahon does not disclose the features as recited, for example, in claim 23 of the present application.

In view of the above, it is respectfully submitted that the rejection is overcome.

#### IV. CONCLUSION

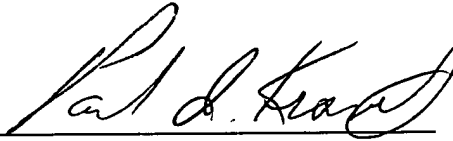
In view of the foregoing amendments and remarks, it is respectfully submitted that each of the claims patentably distinguishes over the prior art, and therefore defines allowable subject matter. A prompt and favorable reconsideration of the rejection along with an indication of allowability of all pending claims are therefore respectfully requested.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

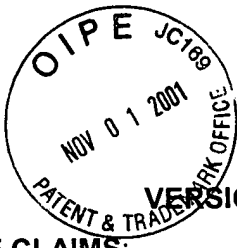
Respectfully submitted,

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Serial No.: 09/631,355

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE  
IN THE CLAIMS:**

Please AMEND the following claims:

23. (ONCE AMENDED) A polarization control optical space switch comprising a plurality of polarization control optical switches cascaded together;  
wherein each polarization control optical switch [includes] comprises:  
a first polarization controller that is capable of changing the polarization of light incident thereon by one of applying voltage thereto and not applying voltage thereto;  
[an] a first element to change the optical path of light from said first polarization controller;  
a delay plate to change the polarization of light incident thereon from said first element; and  
a second element to change the optical path of light from said delay plate; and  
a final polarization control optical switch [including] comprising:  
a second polarization controller that is capable of changing the polarization of light incident thereon by one of applying voltage thereto and not applying voltage thereto; and  
[an] a third element to change the optical path of light from said second polarization controller,  
wherein said polarization control optical space switch has a plurality of inputs and the same number of outputs, and  
wherein [to switch] switching light from one input to one output requires controlling only [a single element making up said polarization controllers] one of said first, second and third elements.

24. (ONCE AMENDED) A polarization control optical space switch according to claim [34] 23, wherein said delay plate includes segments that do not delay light incident thereon.

25. (ONCE AMENDED) A polarization control optical space switch according to claim [34] 23, wherein said first element to change the optical path of light from said first polarization controller and the second element to change the optical path of light from said delay

plate only change the optical path of p-polarized light.

26. (ONCE AMENDED) A polarization control optical space switch according to claim [34]23, wherein said element to change the optical path of light from said polarization controller and the second element to change the optical path of light from said delay plate only change the optical path of s-polarized light.

27. (ONCE AMENDED) A polarization control optical space switch according to claim [34] 23, wherein said first element to change the optical path of light from said first polarization controller changes the optical path by moving light incident at the i-th input thereto to one of the (i-1)th and (i+1)th output.

28. (ONCE AMENDED) A polarization control optical space switch according to claim [34]23, wherein said second element to change the optical path of light from said delay plate changes the optical path by moving light incident at [the] an i-th input thereto to one of [the] an (i-1)th and an (i+1)th output.

29. (ONCE AMENDED) A polarization control optical space switch according to claim [34] 23, wherein said first element to change the optical path of light from said first polarization controller is a downward polarizing beam splitter, which reflects incident light with a predetermined polarization input on the i-th input to the (i+1)th output.

30. (ONCE AMENDED) A polarization control optical space switch according to claim [34]23, wherein said second element to change the optical path of light from said delay plate is an upward polarizing beam splitter, which reflects incident light with a predetermined polarization input on [the] an i-th input to [the] an (i-1)th output.

31. (ONCE AMENDED) A polarization control optical space switch according to claim [34] 23, wherein the first element to change the optical path of light from said first polarization controller is constructed from a polarizing beam splitter array consisting of a combination of polarizing beam splitters.

**Please ADD the following NEW claims:**

32. (NEW) A polarization control optical space switch comprising:  
a plurality of polarization control optical switches connected together between a plurality of inputs and a corresponding plurality of outputs, each of said plurality of polarization control optical switches comprising:

a polarization controller changing the polarization of the light incident thereon by one of applying voltage thereto and not applying voltage thereto; and

a switching element changing the optical path of the light from said polarization controller, wherein switching light from one of said plurality of inputs to one of said plurality of outputs requires controlling only one switching element provided in the respective one of said plurality of polarization control optical switches.

33. (NEW) A polarization control optical space switch comprising:  
polarization control optical switches, each having a plurality of inputs and a plurality of outputs and connected together as a matrix defined by columns and rows, each of the polarization control optical switches comprising:

a polarization controller changing the polarization of light received by a respective input of the respective polarization control optical switch and incident on the polarization controller by one of applying voltage thereto and not applying voltage thereto, and

a switching element selectively outputting the polarization changed light to a respective output of the respective polarization control optical switch,

wherein switching light from a respective input of a respective polarization control optical switch in a first column of the matrix to a respective output of a respective polarization control optical switch in a last column of the matrix requires controlling only one switching element in the matrix.

34. (NEW) A polarization control optical space switch as in claim 33, wherein the matrix is an  $N \times N$  matrix.

35. (NEW) An apparatus comprising:  
an optical space switch comprising:  
polarization control optical switches, each having a plurality of inputs and a plurality of outputs and connected together as a matrix defined by columns and rows, each of

the polarization control optical switches comprising:

a polarization controller changing the polarization of light received by a respective input of the respective polarization control optical switch and incident on the polarization controller by one of applying voltage thereto and not applying voltage thereto, and  
a switching element selectively outputting the polarization changed light to a respective output of the respective polarization control optical switch,

wherein switching light from a respective input of a respective polarization control optical switch in a first column of the matrix to a respective output of a respective polarization control optical switch in a last column of the matrix requires controlling only one switching element in the matrix.

36. (NEW) A polarization control optical space switch comprising:

polarization control optical switches, each having a plurality of inputs and a plurality of outputs and connected together as a matrix defined by columns and rows, each of the polarization control optical switches comprising:

a polarization controlling means for changing the polarization of light received by a respective input of the respective polarization control optical switch and incident on the polarization controlling means by one of applying voltage thereto and not applying voltage thereto, and

a switching means for selectively outputting the polarization changed light to a respective output of the respective polarization control optical switch,

wherein switching light from a respective input of a respective polarization control optical switch in a first column of the matrix to a respective output of a respective polarization control optical switch in a last column of the matrix requires controlling only one of the switching means in the matrix.

37. (NEW) A polarization control optical space switch as in claim 36, wherein the matrix is an  $N \times N$  matrix.

38. (NEW) An apparatus comprising:

an optical space switch comprising:

polarization control optical switches, each having a plurality of inputs and a plurality of outputs and connected together as a matrix defined by columns and rows, each of

the polarization control optical switches comprising:

a polarization controlling means for changing the polarization of light received by a respective input of the respective polarization control optical switch and incident on the polarization controlling means by one of applying voltage thereto and not applying voltage thereto, and

a switching means for selectively outputting the polarization changed light to a respective output of the respective polarization control optical switch,

wherein switching light from a respective input of a respective polarization control optical switch in a first column of the matrix to a respective output of a respective polarization control optical switch in a last column of the matrix requires controlling only one of the switching means in the matrix.